Table 4-16. Tank AY-102 Annulus Ventilation Outages 2003-Present

Start	End	Days	Start	End	Days
05/06/2003	05/30/2003	24	12/19/2006	12/22/2006	3
12/01/2003	12/23/2003	22	04/26/2007	05/11/2007	15
01/06/2004	01/17/2004	11	07/08/2007	07/17/2007	9
02/20/2004	03/05/2004	14	01/13/2008	04/09/2008	87
03/08/2004	04/06/2004	29	04/03/2009	04/16/2009	13
05/10/2004	05/13/2004	3	05/04/2009	05/27/2009	23
09/01/2004	09/08/2004	7	04/16/2010	05/13/2010	27
12/12/2004	12/23/2004	11	07/19/2010	07/23/2010	4
11/07/2005	11/11/2005	4	10/17/2010	02/23/2011	129
03/07/2006	03/22/2006	15	11/08/2011	01/14/2012	67
11/12/2006	11/21/2006	9	04/12/2012	04/25/2012	13
11/25/2006	12/05/2006	10			

4.2.2.3 Pathways for Possible Contamination in the Tank AY-102 Annulus

There are three possible pathways that exist for contamination to enter the annulus region from the primary tank other than a tank leak:

- Tank AY-102 was originally designed with a valved cross-tie to ventilate both the primary and annulus headspaces from either system. However, this was never used and the cross-tie was removed by Project W-030 (Tardiff 2001).
- The second pathway exists when the waste liquid level is below 60 in., exposing the inlet of the annulus pump pit drain leg. This event has occurred several times, the first recorded in 1976 and then again in the 1985-1986 time frame. This has resulted in low-level contamination in the annulus pump pit and probably the annulus itself (see Section 4.2.5 for details).
- The third pathway is via the exposed leak detection pump pit drain leg that also exists when the waste liquid level is below 60 in.

The annulus was sampled extensively in 1999 for smearable contamination. Swabs of the primary tank surface and floor and of all annulus risers resulted in no contamination found. The annulus pump pit smears resulted in 2,000-3,000 dpm/100 cm^2, which were reduced after reseating a drain plug. Generally, equipment removed from annulus risers has been contamination free.

4.2.2.4 Presence of Water in the Annulus

Annulus water ingress and corrosion of ventilation piping have been observed in Tank AY-102, as documented in memorandum 7G41-JKE/MJR-007-005 (Engeman and Rodgers 2007). A number of actions performed in 2006-2008, and discussed in Section 4.2.3, were believed to have eliminated previous water intrusions.

Water can be introduced to the annulus when the ENRAF leak detection probes are flushed during recalibration. Water is also introduced as couplant used during UT examinations of the primary tank wall.

Several studies have examined the possibility that a seasonal moisture accumulation and evaporation cycle occurs within the annulus, but the possibility of a net water accumulation cycle has not been demonstrated (RPP-32420, *Tank 241-AY-101 Annulus Ventilation System Psychrometric Data Evaluation*).

4.2.2.5 Annulus Ventilation Summary

The Tank AY-102 annulus ventilation system currently operates at -15-in. wg pressure and about 850 ft^3/min airflow. The system has experienced multiple prolonged outages, with the longest outage of approximately 6 years from 1991 to 1997 during ventilation upgrades. Since 2003, the longest outage of 129 days occurred from October 2010 to February 2011.

The cross-connections between the primary tank headspace and the annulus system present a contamination backflow pathway. Historical records indicate cross-contamination has occurred several times since first recorded in 1976. In 1999, contamination surveys of the annulus determined the surfaces were contamination-free; the annulus pump pit contamination ranged up to 3,000 dpm/100 cm^2.

Water intentionally is introduced during ENRAF leak detector flushing and UT examinations. Seasonal humidity variations have been studied to determine whether or not a chronic humidity-driven water accumulation in the annulus is possible; the results were inconclusive.

4.2.3 Water Intrusion

On March 31, 1986, an annulus exhaust ventilation pipe for Tank AY-102 was punctured while performing air lift circulator upgrades and the pipe was found to be severely corroded (Rockwell International internal letter, 65950-86-328). A follow-on investigation indicated both Tank AY-101 and Tank AY-102 annulus ventilation systems were severely corroded while the primary ventilation system was not (Rockwell International internal letter, 65950-86-396). It was determined that the annulus ductwork was corroded only where it directly contacted the soil. A review of the construction specifications along with visual and ultrasound inspection indicated the annulus ventilation ductwork was wrapped in the AZ Farm.

In 2001, significant corrosion was identified in the annulus on the outside of the primary tank of Tank AY-102 during tank video inspection (Occurrence Report RP-CHG-TANKFARM-2001-0106; RPP-9497, *Year 2001 Visual Examinations of Tank Annuli at Tanks 241-AY-102 and 241-AZ-101*). It was concluded that the corrosion had occurred since the previous 1992 visual inspection. Increased corrosion was attributed to water intrusion from external sources, coupled with shutdown of the annulus ventilation system for an extended period. The corrosion was similar to that previously documented in Occurrence Report, RP-CHG-TANKFARM-2001-0004, *Corrosion Observed in Double-Shell Tank 241-AY-101 during Video Inspection and Ultrasonic Testing*, for Tank AY-101. There it was reported that, "Water infiltration due to leakage from raw water lines located above the tank dome and natural storm run-on and run-off together with the inoperability of the tank ventilation system appear to be the cause" (RPP-9497).